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## WHAT IS CLAIMED IS: -

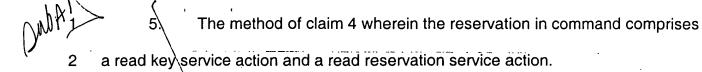
reservation with the shared storage system.

A method for providing access to a logical unit number of a shared storage system when a hardware failure occurs in a first of multiple input/output paths using a second of the multiple input/output paths, the method comprising mapping open options of the operating system to SCSI persistent reserve commands to allow all of the multiple paths to register with the logical unit number of the shared storage system and to allow the second of the multiple paths to access the logical unit number of the shared storage system after obtaining a persistent

- 2. The method of claim 2 wherein the mapping open options of the operating system to SCSI persistent reserve commands to allow all of the multiple paths to register with the logical unit number of the shared storage system further comprises registering all paths from a first host with the logical unit number of the shared storage system using a single reservation key.
- 3. The method of claim 1 wherein the mapping open options of the operating system to SCSI persistent reserve commands further comprises obtaining information about persistent reservations and reservation keys.
- 1 4. The method of claim 3 wherein the obtaining information about 2 persistent reservations and reservation keys further comprises using a reservation in 3 command.

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- 6. The method of claim 1 wherein the mapping open options of the operating system to SCSI persistent reserve commands further comprises issuing a persistent reserve out command for initiating an action with the logical unit number of the shared storage system.
- 7. The method of claim 6 wherein the persistent reserve out command for initiating an action with a logical unit number of the shared storage system further comprises a service action chosen from the group consisting of register, reserve, release, clear, preempt, register and ignore existing key, and preempt with abort.
- 1 8. The method of claim 7 wherein the register service action comprises 2 an add and a remove option.

persistent reservation.

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1	The method of claim 7 wherein the add option further comprises:
2	registering each path when configuring;
3	determining whether a first registration attempt was a success;
4	at open time, registering all paths register again with register and ignore
5	existing key;
6	after failure happens, issuing by the takeover host a forced open to cause a
7	persistent reserve out with preempt and abort service option command to clear all
8	registrations keys which match the preempted reservation key; and
9	setting a state for the path to true when the first or second registration attempt
10	is successful.
1	10. The method of claim 7 wherein the remove option further comprises:
2	determining whether a path has a persistent reservation;
3	issuing a persistent reserve out with service option release set when the path
4	is determined to have a persistent reservation; and
5	releasing the reservation when the when the path is determined to not have a

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b)	\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\	The method of claim 7 wherein the reserve service action comprises:
	2	deciding whether a device needs to make a reservation to the logical unit
	3	number of the shared storage system by examining whether a command parameter
	4	is set;
	5	defaulting to a reserve required when a command parameter is not set and
	6	implementing a persistent reserve to the logical unit number of the shared storage
	7	device when no initiator has reserved the logical unit number of the shared storage
	8	device; and
	9	when a command parameter is set executing the command parameter.
7		
hiii hiii die 1640 wil 1640 Aud	1	12. The method of claim 11 wherein the command parameter is a forced
	2	open option, the forced open option causing the device to read the current
	3	reservation key, preempt and abort queued tasks when the current reservation key

does not match the device's reservation key.

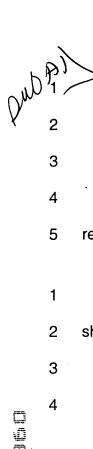
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1∖3.	The method of claim	12 further	comprising

preventing SCSI-2 reservations by setting the command parameter to no reserve:

- determining whether the forced open completes successfully;
- setting the device's reservation flag to the path index that made a persistent reservation and opening all paths with no SCSI-2 reserve option set when the forced open command complete successfully; and
  - issuing an error code when the forced open command does not complete successfully.
  - 14. The method of claim 11 wherein the command parameter is a retain reservation option, the retain reservation causing the device to read the current reservation key, determine whether a key is returned, establish that the logical unit number is not reserved by an initiator and make persistent reservation when a key is not returned.
  - 15. The method of claim 14 wherein the retain reservation option causes the device to determine whether a returned key matches a reservation key for the device, to issue an error code when the returned key does not match the reservation key for the device, and when the returned key matches the reservation key for the device open all paths with a no SCSI-2 reserve option set, set a reserve flag to the path index that made a persistent reservation, set the retain reserve to true and check a retain reserve field at close to determine if persistent reserve should be released.

- 16. The method of claim 11 wherein the command parameter is a no
  reserve option, the no reserve option causing the device to read the current
  reservation key, determine whether a key is returned, establish that the logical unit
  number is not reserved by an initiator and opening all paths with original command
  parameter from a host.
  - 17. The method of claim 16 wherein the no reserve option causes the device to determine whether a returned key matches a reservation key for the device, to issue an error code when the returned key does not match the reservation key for the device, and when the returned key matches the reservation key for the device issue a persistent reserve out with release.
  - 18. The method of claim 11 wherein the command parameter is a default reserve option, the default reserve option causing the device to check all paths, determine whether any paths are unregistered, register all unregistered paths, ignoring any paths that do not register successfully, return and read a reservation key, issuing an error code when the returned reservation key does not match a reservation key of the device and open all registered paths with no SCSI-2 reserve set.

- 19. The method of claim 18 wherein the default reserve option causes the device when a key is not returned to select a registered path, issue a persistent reserve for the selected registered path, ignoring the path if the persistent reservation is not successful, and when the persistent reservation is successful marking a reserve field with the path index that made the reservation and open all registered paths with the command parameter set to no SCSI-2 reserve.
  - 20. The method of claim 11 wherein the command parameter is a single option, the single option causing the device to check all paths, determine whether any paths are unregistered, register all unregistered paths, ignoring any paths that do not register successfully, return and read a reservation key, issuing an error code when the returned reservation key does not match a reservation key of the device and open all registered paths with no reserve set.
  - 21. The method of claim 20 wherein the single option causes the device when a key is not returned to select a registered path, issue a persistent reserve for the selected registered path, ignoring the path is the persistent reservation is not successful, and when the persistent reservation is successful marking a reserve field with the path index that made the reservation and open all registered paths with the command parameter set to no reserve.



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22.	The method of	claim 7 wherein	tne release	service actio	n combases

- closing all paths not reserved-with a persistent-reservation flag set;
- opening a path with a persistent reservation flag set; and
- 4 issuing a persistent reserve out command with a release service action set to
- 5 release a persistent reservation for a path.
- 1 23. A method for supporting SCSI persistent reserve commands by a
- 2 shared storage system; comprising:
- processing reservation keys to identify registered hosts; and
- 4 processing persistent reservation commands to control access by a host.
- 1 24. The method of claim 23 wherein the processing of persistent
- 2 reservation commands comprises allowing all of the multiple paths to register with
- 3 the logical unit number of the shared storage system
- 1 25. The method of claim 24 further comprising registering all paths from a
- 2 first host with the logical unit number of the shared storage system using a single
- 3 reservation key.
- 1 26. The method of claim \$3 wherein the processing reservation keys
- 2 comprises obtaining information about persistent reservations and reservation keys.
- 1 27. The method of claim 26 wherein the obtaining information about
- 2 persistent reservations and reservation keys further comprises using a reservation in
- 3 command.

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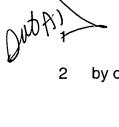
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- The method of claim 27 wherein the reservation in command comprises a read key service action and a read reservation service action.
  - 29. The method of claim 23 wherein the processing of persistent reservation commands comprises issuing a persistent reserve out command for initiating an adtion with the logical unit number of the shared storage system.
    - The method of claim 29 wherein the persistent reserve out command 30. for initiating an action with a logical unit number of the shared storage system further comprises a service action chosen from the group consisting of register, reserve, release, clear, preempt, register and ignore existing key, and preempt with abort.
    - A driver for mapping open options of the operating system to SCSI persistent reserve commands, the driver configured to process reservation keys to identify registered hosts and to process persistent reservation commands to control access by a host.
- The driver of claim 31 wherein the driver processes persistent 32. reservation commands by allowing all of the multiple paths to register with the logical 2 3 unit number of the shared storage system
- 1 33. The driver of claim 32 wherein the driver registers all paths from a first host with the logical unit number of the shared storage system using a single 2 3 reservation key.



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- The driver of claim 31 wherein the driver processes reservation keys
- 2 by obtaining information about persistent reservations and reservation keys.
- 1 35. The driver of claim 346 wherein the driver obtains information about 2 persistent reservations and reservation keys by using a reservation command.
- 1 36. The driver of claim 35 wherein the reservation command comprises a read key service action and a read reservation service action.
  - 37. The driver of claim 31 wherein the driver processes persistent reservation commands by issuing a persistent reserve out command for initiating an action with the logical unit number of the shared storage system.
  - 38. The driver of claim 37 wherein the persistent reserve out command for initiating an action with a logical unit number of the shared storage system further comprises a service action chosen from the group consisting of register, reserve, release, clear, preempt, register and ignore existing key, and preempt with abort.